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Testing methods for pervious concrete —

Part 3:
Resistance of surface degradation

Méthodes d'essai pour ciments perméables —

Partie 3: Résistance de la dégradation de surface

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Foreword

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This document was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 1, *Test methods for concrete*.

A list of all parts in the ISO 17785 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Testing methods for pervious concrete —

Part 3:
Resistance of surface degradation

1 Scope

This document specifies a procedure for testing the resistance of surface degradation of pervious concrete specimens in the laboratory. This document also specifies procedures for measuring the mass loss of specimens subjected to combined action of impact and abrasion in a rotating steel drum.

2 Normative references

ISO 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

ISO 17785-2, *Testing methods for pervious concrete — Part 2: Density and void content*

ASTM C131/C131M, *Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine*

ASTM D6926, *Practice for Preparation of Bituminous Specimens Using Marshall Apparatus*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
pervious concrete
concrete which has interconnected voids that allow for water flow through them

3.2
design density
mass of a unit volume of pervious concrete based on the theoretical mixture proportions and void content

4 Principle

4.1 Method

This test method consists of casting cylindrical specimens and subjecting the cured specimens to a combination of actions by impact and abrasion in a rotating steel drum.

4.2 Resistance

The resistance to surface degradation by impact and abrasion is expressed as the percentage mass loss after 500 revolutions of the steel drum.

4.3 Comparison

This test allows the comparison of the relative potential resistance to surface degradation of pervious concrete mixtures of varying proportions and raw materials.

5 Apparatus

5.1 Balance or scale, accurate to 1 g at any point and capable of weighing up to 2,5 kg.

5.2 Scoop or spoon, of a size large enough so each amount of pervious concrete obtained from the sampling receptacle is representative and small enough so that the concrete is not spilled during placement in the cylinder mould.

5.3 Cylinder moulds, a cylindrical container made of steel or other suitable metal not readily attacked by cement paste, having a smooth internal face, with the rim machined to a plane surface. Cylinder moulds shall be 100 mm in diameter and 200 mm tall.

5.4 Hammer for compaction, a device used to compact the pervious concrete that shall conform to the requirements for laboratory compaction characteristics in ASTM D6926.

5.5 Length measuring device, a ruler, metal roll-up measuring tape, or similar length-measuring device marked in increments of 1 mm or smaller. The device length shall be at least 300 mm.

5.6 Rotating steel drum, so-call as Los Angeles machine, that conforms to the standard test methods for resistance to degradation of small-size coarse aggregate by abrasion and impact. All essential characteristics to the design of a rotating steel drum shall conform to those of ASTM C131.

5.7 Sieves, woven metal wire cloth and perforated plate complying with the requirements of ISO 565.

6 Sampling

The test shall be performed with a minimum of three similar specimens. The specimens shall be made based on the specifications applicable to the project and area of construction. The density of the fresh pervious concrete for samples shall be determined and recorded in accordance with ISO 17785-2.

7 Specimen preparation

7.1 Filling

Calculate to the nearest 1 g the mass of pervious concrete to fill the mould to a height of 100 mm at the design density. Place the balance on a flat, level surface free from vibration. Moisten the inside of the mould and wipe any excessive water from the surfaces. Place the mould on the balance and measure the mass of the empty mould. Place the pervious concrete in the mould using a scoop and adjust concrete mass to within ±5 g of the calculated fresh mass using a scoop or a spoon. Move the cylinders to the place for consolidation.

7.2 Consolidation

Drop the mould from a height of 25 mm ± 12 mm ten times onto the level, rigid surface. Use the compaction hammer to consolidate the first specimen to a specified height of 100 mm ± 2 mm. For a stiff mixture, drop the hammer from the full height and for a highly workable mixture, use one-half or one-third of the full drop height as is applicable. Use the measuring device to determine the height of the compacted specimen after each blow. Provide additional hammer blows as needed to achieve the specified height. If a specimen is over-compacted, discard the concrete. Record the number of the hammer blows necessary to compact the first specimen to the specified height and use that number of blows for the remaining specimens in the set. If less than full blows are used, each specimen shall be checked to ensure the specified height is attained.

7.3 Finishing and storage

Upon completion of moulding, place tight fitting caps or bags on the open end of the cylinder moulds to prevent moisture loss during storage. The supporting surface on which specimens are stored for initial curing shall be level to within 20 mm per m.

7.4 Curing

Immediately after moulding, the specimens shall be stored for a period up to 48 h in a temperature range from 16 °C and 27 °C and in an environment preventing moisture loss from the specimens. Shield the specimens from direct sunlight and radiant heating system. The storage temperature shall be controlled by use of heating and cooling devices, as necessary. Specimens shall not be transported until at least 24 h after casting.

Cure specimens at a temperature of 20 °C ± 2 °C (27 °C ± 2 °C for tropical countries). The specimen shall remain in the covered mould and the mould shall be removed after a minimum curing of seven days.

8 Measuring procedure

8.1 Curing

After completion of curing, remove the cylinder moulds, caps or bags. Wipe the specimens dry of any free moisture and place the three specimens used to provide a single test result on the balance. Record the mass of the three specimens as the original mass.

8.2 Removing the moulds

Within 30 min after removing the moulds, place the three specimens in the rotating steel drum so that no edges are chipped in the process. Rotate the machine at 30 r/min to 33 r/min for 500 ± 5 revolutions.

8.3 Revolution

After the revolutions, discharge the material from the machine and hand sieve the material on a 25 mm sieve. Rotate the particles, if necessary, in order to determine whether they will pass through the sieve opening. Record the final mass as that material retained on the sieve.

9 Calculation

9.1 Calculate mass loss

Calculate the mass loss as the difference between the original mass of the three specimens and the final mass retained on the sieve.

9.2 Divide the mass loss

Divide the mass loss by the original mass of the three specimens and multiply by 100.

9.3 Record mass loss

Record the mass loss as a percentage of the original mass to the nearest 1 %.

10 Test report

In the event of a report being prepared, the following information shall be included:

a) identification of the sample;

b) a reference to this document, i.e. ISO 17785-3:2023;

c) identification of the specimen;

d) identification of the mixture;

e) number of blows necessary for compaction;

f) maximum and minimum temperature for initial curing;

g) original mass and final mass of the three specimens;

h) mass loss as a percentage of the original mass to the nearest 1 %;

i) density and void content of the mixture;

j) any deviations from the procedure;

k) any unusual features observed.

Bibliography

[1] ISO 1920-1, *Testing of concrete — Part 1: Sampling of fresh concrete*

[2] ISO 1920-2, *Testing of concrete — Part 2: Properties of fresh concrete*

[3] ISO 1920-3, *Testing of concrete — Part 3: Making and curing test specimens*

[4] ISO 1920-5, *Testing of concrete — Part 5: Density and water penetration depth*

[5] ISO 17785-1, *Testing methods for pervious concrete — Part 1: Infiltration rate*

[6] ASTM C1747/1747M, *Standard Test Method for Determining Potential Resistance to Degrdation of Pervious Concrete by Impact and Abrasion*

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